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ABSTRACT

Research was conducted upon relationships between students' conceptual level (CL) and form of course organization (high/low structure) as it affects student attainment of course objectives. In addition, feelings toward the training organization were observed. Synectics training was conducted in which thirty-six undergraduate teacher trainees were paired as to conceptual level and divided into two groups, one receiving a high structure training format in which learning activities, sequence, and pace were determined by the instructor, the other receiving low structure training in a student-centered format. Existence was hypothesized for (1) a positive relationship between CL and performance in low structure treatment; (2) no relationship or a negative relationship between CL and performance in high structure treatment; (3) a negative relationship between CL and feelings toward training in low structure treatment; and (4) a negative relationship between CL and feelings toward training in high structure treatment. Posttesting revealed a high consonance between subjects' performance of the Synectics teaching model and their feelings toward training, regardless of treatment, though performance and feelings were somewhat higher under conditions of high structure than under conditions of low structure. Likely factors for explaining this discrepancy between predicted findings and the results are inadequate control of intervening variables, weakness of instrumentation, nature of the task, design of treatments, and/or limitations of theory. Debriefing of the subjects revealed a preference for low structure treatment and agreement upon the value of peer teaching, demonstration lessons, video-tape use, and other teaching techniques used in the research. (MB)

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Effects of Conceptual Level and Structure of Training Intervention Upon the Acquisition of a Teaching Strategy

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Personalizing instructional programs for the preparation of teachers is a complex and critical task facing today's teacher educators. Just as the public demands that teachers provide individual attention for students, teachers in turn are expecting teacher education programs tailored to fit their unique abilities and needs. Building these programs necessitates examining teachers' individual characteristics and designing treatments which most effectively interact with these characteristics to produce persons who are satisfied with their education and able to perform to the fullest of their abilities. This research, based on previous work in the area of aptitude treatment interaction (ATI), was an attempt to examine how different teachers interacted with different teacher education environments to produce teaching behavior. Specifically, it investigated the interactive effects of the trait of conceptual level[3,4] and two treatments upon the abilities of a group of preservice teachers to implement a model of teaching[2,6]. The study also investigated subjects' feelings toward their training.

Using Conceptual Systems theory as explicated by Harvey, Hunt and Schroder, four hypotheses were formed to guide the investigation of the study. On this theoretical basis it was relevant to predict the effects of CL (conceptual level) and the structure of the training environment on subjects' abilities to learn to perform a teaching model, as well as the possible effects on subjects' preferences for a particular mode of training: (a) There will be a positive relationship between conceptual level and performance of the Synectics model in the low structure treatment. It would be expected that these findings would be consistent with McLachlan's[9] findings that under conditions of low structure, the higher an individual's CL, the greater his ability to learn and thus perform. (b) There will be

either no relationsip or a negative relationship between conceptual level and performance of the Synectics strategy in the high structure treatment. Conceptual Systems theory predicts that persons who are high in conceptual level can learn in either a low structure or a high structure environment, but prefer to learn under conditions of low structure. McLachlan found no relationship between CL and performance under conditions of high structure. Tomlinson,[13] on the other hand, found that under conditions of increasing structure, there was a point at which high CL individual's performances began to decline, thus reinforcing the possibility that high structure may have a debilitating effect on the performance of higher CL individuals. (c) There will be a negative relationship between conceptual level and feelings toward training in the low structure treatment. Conceptual Systems theory predicts that as CL increase, the preference for a low structure environment also increases. Tuckman[14] illustrates this preferential style of higher conceptual level individuals. He found high CL persons more satisfied with and preferring conditions of low structure. (d) There will be a negative relationship between conceptual level and feelings toward training in the high structure treatment. One would expect that the higher a person's CL, the less he will prefer a training environment of high structure.

Design

This study utilized a post test only design. Data were analyzed using regression analysis for continuous and categorical variables.[7] Regression equations were found between the independent variables of conceptual level and two treatments (high and low structure) and two dependent variables (performance of a teaching model and subjects' feelings toward training). Hypotheses were tested at the .05 level of significance.

Subjects

The sample consisted of thirty-six undergraduate prospective teachers who were enrolled in a required course at Syracuse University. Subjects were juniors and seniors who were majoring in elementary education and various secondary education areas such as music, history, English and physical education. There were five males and thirty-one females. All had prior experience working with children of various ages in some type of instructional setting.

Criterion and Aptitude Tests

The conceptual levels of individual subjects were measured by the Paragraph Completion Test. Conceptual level is a measure of an individual's integrative complexity and interpersonal orientation. The subject, given two minutes for each item, responds in writing to the following six items: "What I think about rules...," "When I am criticized...," "What I think about parents...," "When someone disagrees with me...," "When I am not sure...," "When I am told what to do..." Responses are coded using the manual developed by Hunt, et.al.(5) A subject's CL is calculated by taking the mean of the highest three of six scores.

The Evaluation Guide for Synectics was used to measure subjects' performances of the Synectics model of teaching. The Guide is a criterion checklist developed by the staff of Columbia Teachers College Pre-Service Education Program with minor modifications for use in this study. A possible score ranging from zero to thirty is determined by examining the audiotaped interactive behavior of the teacher and pupils in the following phases of a Synectics lesson: (1) planning, (2) describing the present condition, (3) direct analogy, (4) personal analogy, (5) compressed conflict, (6) new

direct analogy, (7) re-examination of the original task.

The affective measure was adapted from a scale used by Maehr and Stallings and Myrow [10]. This eight item questionnaire is designed to measure subjects' feelings toward various aspects of their training. Subjects rated their agreement-disagreement with statements such as: "The class sessions were very interesting." "Doing this work was a waste of time", etc. Four of the items were positively phrased and the other four were negatively phrased. Weights were assigned to the five dimensions of agreement-disagreement. The eight items were summed to yield an overall measure of the subjects' feelings toward training.

Treatments

The high structure treatment could be characterized as a teacher-directed course format. Subjects were exposed to training as a whole group, in a step-by-step process in a series of four, one and one-half hour sessions. Subjects worked through a predetermined training schedule which left little or no opportunity for deviation. The instructor controlled the choice of learning activities, the sequence of these activities and the pace of subjects' work according to the following schedule: (session 1) Subjects worked through the Synectics theory module and stretching module in class. These largely self-instructional materials [15] were designed to acquaint persons with the development and utilization of Synectics. Subjects received a reading assignment and were told that they would be quizzed orally about the reading at the next session. (session 2) Subjects were quizzed orally concerning the previous reading assignment and worked through the demonstration module. They viewed a videotape of a Synectics lesson and critiqued it using the Evaluation Guide for Synectics. Reading was assigned

and an oral quiz covering those readings was announced for the next session. (session 3) An oral quiz was given on the previous readings. Subjects functioned as participant-observers in a Synectics lesson with the instructor. The students were given the peer teaching module and began peer teaching. Subjects were given the final reading assignment. (session 4) Subjects continued peer teaching so that each person would have an opportunity to take the role of teacher. At the conclusion of the session they completed the affective measure.

The low structure treatment could be characterized as a student-centered course format. Each individual subject determined the choice of his learning activities, sequence of these activities and pace of his work. Subjects were exposed to four, one and one-half hour training sessions as follows: (session 1) Subjects were presented with a packet of learning materials consisting of the Evaluation Guide for Synectics, theory module, stretching module, demonstration module and peer teaching module. These materials were accompanied by a cover sheet outlining the instructional activities. Subjects had the opportunity to select from the following activities: (a) Work alone, in pairs or small groups on the modules and/or (b) view and critique videotapes of Synectics lessons and/or (c) participate in a demonstration Synectics lesson with the instructor and/or (d) peer teach a Synectics lesson and/or (e) spend time reading from the text. (sessions 2, 3, 4) These sessions offered students the same options listed above. In addition, at the conclusion of session 4 all subjects completed the affective measure. In this low structure treatment subjects were asked to complete time sheets specifying the activities they selected and the time they spent on those activities.

Procedure

The Paragraph Completion Test was administered to subjects to assess

their conceptual levels. Scores on the test were rank ordered; matched pairs were formed and randomly assigned to two treatments. A brief introductory lecture on Synectics was given to the combined groups. During this combined session subjects were told they were part of a study to investigate different methods of preparing teachers. It was explained that the class would be splitting into two groups for a period of four weeks. The week following this training period would be held open for their work in the public schools. The expectations for all subjects were made explicit, i.e., each person would be required to teach a Synectics lesson with a microclass of elementary school children. All persons in both treatments had access to the same learning materials. The affective measure, an instrument designed to assess feelings toward training, was administered at the conclusion of the final training sessions of both treatments, prior to subjects' performances of the Synectics model with children.

When each subject reported at the elementary schools for their microteaching performance of the model, he was given a packet containing three sheets: instructions, a planning sheet to use as a guide and topics for the lesson. Each subject was allotted a total of one and one-half hours for preparation and teaching. The sessions were recorded on audio-tape . The tapes were examined using the Synectics Evaluation Guide to determine subjects' performance scores.

Results

Noting Table 1, subjects performances of the teaching model and their feelings toward training, regardless of treatment, were remarkably consonant. Performances and feelings toward training were somewhat higher under conditions of high structure than under conditions of low structure.

Table 2 provides coefficients of correlation between variables. Examination of the relationships between CL and performance under conditions of both low and high structure yielded coefficients of correlation of .13 and .26 respectively. Both coefficients indicate relationships in the positive direction, expected under conditions of low structure but not in the high structure treatment. However, neither coefficient reaches significance, therefore the hypotheses regarding CL and performances of the teaching model must be rejected. Further examination of Table 2 provides coefficients of correlation of -.06 and -.15 for the relationships of CL and feelings toward training in the low and high structure treatments respectively. These coefficients although in the predicted direction, do not reach significance and therefore must be attributed to chance.

To investigate the interactive effects of the independent variables of conceptual treatment (high and low structure) on the dependent variable of performance of the teaching model, it was necessary to determine if there were significant differences between the slopes and the intercepts of the regression lines calculated for each treatment group. The slopes and intercepts were compared simultaneously (11). The proportion of variance accounted for by using separate regression lines as compared to using a commong line resulted in an F ratio of .53 which was not significant. Therefore, the two regression lines can be represented by one common regression line and it can be concluded that an interaction between the independent variables of conceptual level and treatment did not occur.

The interactive effects of the independent variables of conceptual level and treatment (high and low structure) on the dependent variable of feelings toward training were investigated using the procedures described above. An F ratio of 1.18 was calculated. This F ratio failed to reach significance.

Thus the two separate regression lines can be represented by one common regression line. The presence of interaction between the independent variables, conceptual level and treatment, on the dependent variable of feelings toward training were not demonstrated.

Subjects in the low structure treatment were expected to determine their choice of learning activities, the sequence of activites and the time they spent on these activities. In order to compare differences in time devoted to activities a median split was performed on subjects in the low structure treatment yielding nine high and nine low CL subjects. Table 2 represents a series of comparisons of the amount of time spent on the various learning activities by low and high conceptual level students in the low structure treatment. The following activities, in decreasing order, represent priorities in terms of time devoted by subjects: (1) participation with instructor in a demonstration lesson, (2) viewing and critiquing videotapes, (3) working alone, in pairs, or small groups on the modules. The students chose to spend a relatively small amount of time on the two activities of reading from the text and peer teaching.

Discussion

The present research was conducted in both school and university settings and thus was forced to contend with myriad complexities. Any single factor is probably insufficient to account for the discrepancies between the predicated findings and the results. It is more likely that a combination of factors, e.g., inadequate control of intervening variables, weakness of instrumentation, nature of the task, design of treatments and/or limitations of theory may have influenced the experimental process and were reflected in the final outcome.

The fact that subjects in this experiment were taken from a required course rather than being selected in some other more democratic or random manner may have had a bearing on their feelings toward training. Dreeben[1] notes the importance of distinguishing between a person's noncompulsory membership in a group and his voluntary compliance with another person's wishes versus conscripted membership and involuntary compliance. Even though students may not be forced to attend a university, and even pay for the privilege of doing so, their participation in required courses may be considered much less than an act of free will. Being placed in a class which must be passed in order to attain a degree has the function of placing students in a subservient role. Despite assurances to the contrary, subjects in the low structure treatment may have perceived that they were functioning in a situation where the ultimate authority rested with the instructor. If this were the case, any attempt to shift the locus of control (i.e. power for making decisions about selection of learning activities, pace and sequence) from the instructor to the students may have had no more than a cosmetic effect, providing the illusion of low structure.

Shulman[12] notes that ATI research is faced with the problem of measuring aptitudes by micrometers and environments by divining rods. While the Paragraph Completion Test was able to detect fairly discrete differences in the person variable of conceptual level, the treatments were less sensitively differentiated by their degree of structure, i.e., by control over the choice sequence and pace of learning activities. Assuming the treatments were conceptually sound, the study still ignored other possible and perhaps critical dimensions of environmental structure, e.g., selection of content and location of work activities.

Conceptual level or any other single variable does not offer all the answers to individualizing instruction. Hunt[4] notes that if persons are described in terms of their "accessibility channels" to different forms of environmental influence, then a number of educational approaches may be important. When describing the person in terms of cognitive orientation (CL) the relevant learning environment is described in terms of degree of structure. If, however, the person is described in terms of motivational, value or sensory orientations, then the matching environments should be characterized according to the form of feedback and reward, the value context of the presentation, and the modality of the presentation. The treatments in this study were designed to meet the demands of theoretical relevancy and practical generalizability with respect to cognitive structure, but they did not allow for other person-environment influences.

At the conclusion of the post-testing week the audiotapes of subjects' lessons were scored and that information was shared with the participants in a debriefing session. During debriefing subjects offered their reactions to the training sessions and micro-teaching experiences. These comments and suggestions may be helpful in lending direction to the design of other treatments for preparing teachers. Nearly all subjects in the high structure treatment agreed that they would like to have had more time to peer teach. Subjects under conditions of high structure felt that this activity was extremely valuable in preparing them for their micro-teaching experiences in the schools. Subjects in both treatment groups unanimously agreed that functioning as participant-observers in a demonstration lesson with the instructor was the most interesting and perhaps the most useful activity of their training. If one of the goals of a teacher education program is to

maintain interest and build enthusiasm in its participants then the personal interaction between instructor and students in a participant-observer lesson may be one way to work toward this goal.

Subjects generally felt that the videotapes of Synectics lessons were a helpful aid in their training. They noted that the tapes provded a preview of what could be expected in actual classroom use of the strategy. They believed that experiencing the model by viewing a videotape gave them an understanding which could not have been obtained through printed materials. Reaction to the modules was mixed. Some students enjoyed working on them and thought that the modules added substantially to their understanding of the Synectics model. Other students were bored by them and did not think the modules enhanced their performances of the teaching strategy.

When the differences in treatments were discussed, all subjects stated that if they had been given a choice between the low structure and high structure treatments, they would have selected the conditions of low structure. As the analyses indicated, students who had more control over their own learning performed as well as students who were more tightly controlled by the instructor. Given the negligible difference in cost between the treatments in this study, if similar training conditions exist in the future it would seem reasonable to allow students more control over their own learning in terms of selecting and sequencing activities and appropriating their time.

Even though this research failed to establish support for hypotheses, it raises some interesting questions which challenge typical assumptions about the structure of personalized educational programs. Is an environment which allows students to choose from a given set of learning activities, sequence these activities and pace their own work really a "low" structure

environment? Is it reasonable to characterize an environment where the instructor makes these decisions as "high" structure? Are the two environments actually different from one another? If there are real differences between these environments, are the effects cancelled by students being members of courses in order to fulfill requirements? Does it make sense to differentiate between environments on the basis of variations in training procedures when all students are expected to arrive at the same goal? Answers to these questions and others may help clarify the concept of structure and provide further direction for individualizing programs of teacher education.

Table 1

MEANS AND STANDARD DEVIATIONS ON CONCEPTUAL LEVEL, PERFORMANCE OF SYNECTICS TEACHING MODEL AND FEELINGS TOWARD TRAINING FOR HIGH AND LOW STRUCTURE TREATMENTS

Variable	Structure			
	Low		High	
	Mean	S.D.	Mean	S.D.
	N=18		N=18	
Conceptual Level	1.85	.55	1.91	.58
Synectics Teaching Strategy	20.86	3.16	21.89	4.51
Feelings Toward Training	30.06	6.86	33.00	3.97

Table 3

TIME IN MINUTES SPENT ON DIFFERENT LEARNING ACTIVITIES WITHIN LOW STRUCTURE TREATMENT FOR 9 HIGH AND 9 LOW CONCEPTUAL LEVEL SUBJECTS

Activity	Low CL		High CL		Difference Between Means	t* value of Difference
	Mean	S.D.	Mean	S.D.		
Modules	58.61	46.92	54.72	38.13	3.89	.19
Videotapes	66.94	31.86	76.39	21.47	-9.45	.72
Instructor	72.78	18.56	84.23	9.76	-11.45	1.56
Peer Teaching	10.00	24.87	8.33	25.00	1.67	.14
Reading	30.83	28.67	12.50	11.86	18.33	1.74

*t 2.12 significant at .05 level (two-tailed test), n = 18

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